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A Sport Fisheries Investigation of Sasaginnigak and Fishing Lakes, 1979

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ABSTRACT

Results from a 1979 summer creel census and fish sampling program conducted at fishing lodges on Sasaginnigak and Fishing Lakes were analyzed and compared.

Annual angler harvest was estimated at 8200 kg. at Sasaginnigak Lake and 10,600 kg. at Fishing Lake. Angling success was 0.63 walleye and 0.30 northern pike per angler-hour at Sasaginnigak Lake, and 0.73 walleye and 0.33 northern pike per angler-hour at Fishing Lake. Individual anglers harvested an average of 4.53 kg. and 6.11 kg. per day at each respective lake.

In general, approximately 50% of the fish caught were kept, although this proportion was higher for walleye at Fishing Lake. Each angler consumed an estimated 1.5 kg. of fish per day.

Growth of walleye and northern pike from Sasaginnigak Lake and northern pike from Fishing Lake was positively allometric, while growth of walleye from Fishing Lake was negatively allometric. Population characteristics of creel census walleye were not significantly different from those of lake survey walleye at Sasaginnigak Lake.

The majority of anglers originated from the north-central United States. Anglers at Sasaginnigak Lake were primarily of the

professional and trade occupational classes, whereas those at Fishing Lake were retired or in the trades.

Opinion of angling quality was positively correlated with previous angling experience and catch per angler-hour, but not with the weight of the fish kept.

The evaluation scheme defined by the anglers for catch per angler-hour provided accurate success standards for these two lakes, and was considered to be representative for lakes on the east side of Lake Winnipeg.

Total angler expenditures for the 1979 season were estimated at $509,000 for Sasa-Ginni-Gak Lodge and $376,500 for Fishing Lake Lodge, of which $265,000 and $301,200, respectively, was spent in Manitoba. The average expenditure per angler was $700 at Sasa-Ginni-Gak Lodge and $1,500 at Fishing Lake Lodge.

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INTRODUCTION

A creel census and fish sampling program were conducted at fishing lodges on Sasaginnigak and Fishing Lakes during the summer angling season of 1979 to provide representative data for lakes on the east side of Lake Winnipeg in Manitoba.

Similarity in morphometry and species composition to most lakes on the east side was the primary criteria in the selection of the two lakes as sample sites for this study. In addition, the differences in the services and facilities provided by the two lodges would seem to attract two types of anglers. Sasa-Ginni-Gak Lodge offers non-modern cabins requiring light housekeeping and does not provide guide services. Fishing Lake Lodge provides modern cabins with showers, dining room facilities and guides as part of an all-inclusive package.

The geographic location of the two lakes is illustrated in Figure 1. Sasaginnigak Lake is situated at a latitude of $51^{o}36'$N and longitude of $95^{o}39'$W. It has a surface area of 4,853 ha., maximum depth of 18.0 m. and a mean depth of 5.5 m. Total dissolved solids are 45.0 mg. per liter. Fishing Lake is situated at a latitude of $52^{o}10'$N and longitude of $95^{o}27'$W. It has a surface area of 11,130 ha., maximum depth of 52.5 m. and a mean depth of 11.1 m. Total dissolved solids are 65.0 mg. per liter.

Sport angling on each lake is restricted to the one commercial lodge operation. Detailed maps indicating lodge locations are given in Figs. 2 and 3. Both lodges are only accessible by air. There is currently no commercial fishing on

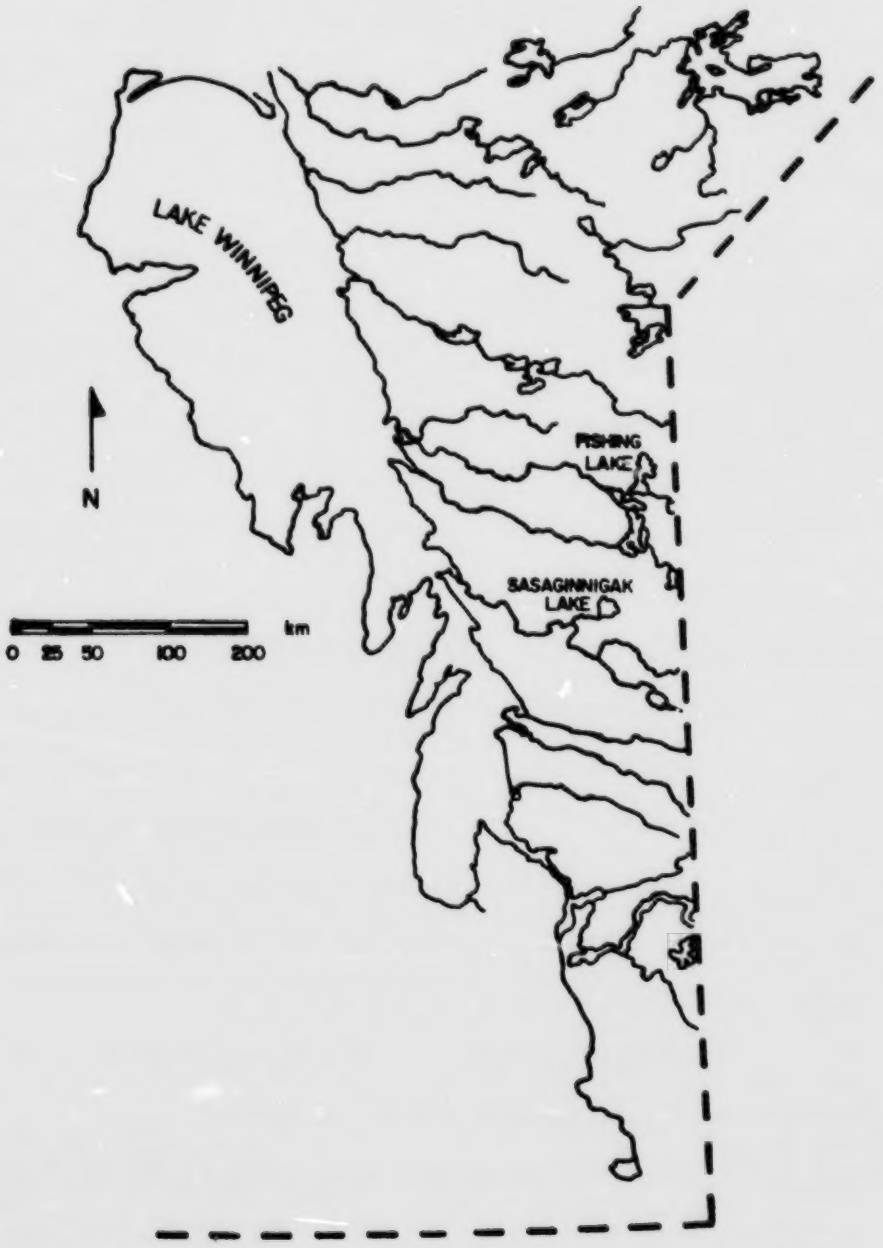

Fig. 1. Geographic locations of Sasaginnigak and Fishing Lakes.

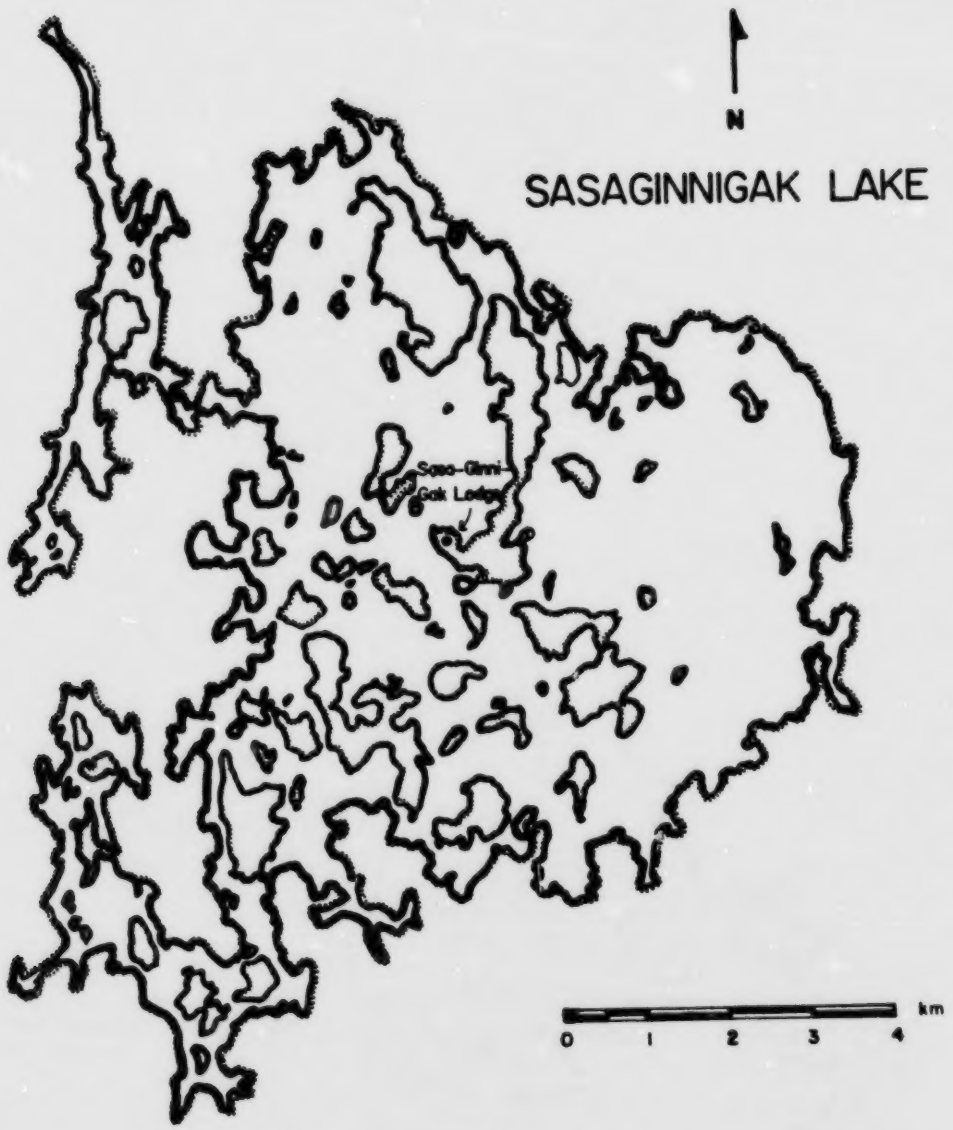

Fig. 2. Map of Sasaginnigak Lake, indicating location of Sasa-Ginni-Gak Lodge.

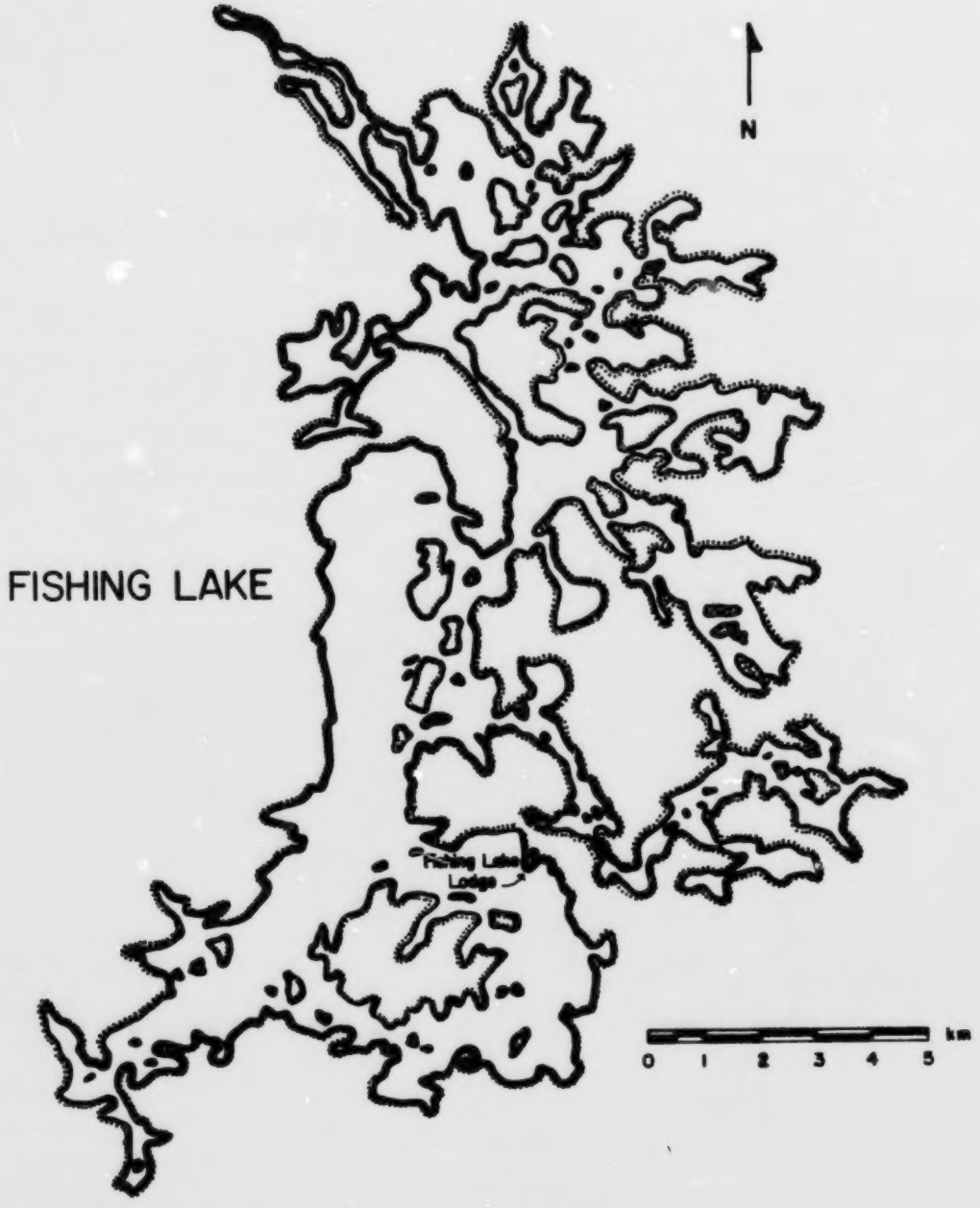

Fig. 3. Map of Fishing Lake, indicating location of Fishing Lake Lodge.

either lake, and domestic consumption, by the residents of the Pauingassi Indian Reserve, is limited to Fishing Lake.

The specific objectives of this study were:

1. to approximate yield and angling success for each species of sport fish being harvested,
2. to determine population characteristics of angling species based on creel census sample data,
3. to investigate the demographics of anglers utilizing the lodge facilities, with respect to place of residence, occupation, opinion of angling quality and expenditures incurred,
4. to provide baseline data for lakes on the east side of Lake Winnipeg for the purpose of refining the Lodge Development Formula, currently used by the Department for recommendations on optimum lodge size.

METHODS

Data collection was carried out from June 1 to August 22, 1979. Each lodge was sampled as an individual unit.

As a result of difficulties in accessibility for both sites, surveys were conducted on a weekly basis rather than on a randomly selected set of days. The sampling design was based on the assumption from previous years that angling pressure would be greatest in the months of July and August, and sampling was most intensive in these periods. The original creel census schedule allowed for four weeks at each site. However, since forest fires

in July prohibited access to Fishing Lake, Sasaginnigak Lake was sampled for an additional week, resulting in a total of five samples from Sasa-Ginni-Gak Lodge and only three from Fishing Lake Lodge.

On each sampling day within the weekly period, all angling parties were interviewed on their return at the end of the day. Information was collected on the number of anglers in each party, their place of residence, occupation, previous fishing experience and opinion of angling quality. Also recorded was the time spent angling, and the number of fish of each species that were caught, kept and consumed. The creel census information form used to record this data is given in Appendix A.

The fish taken by each angler were sampled at 30% intensity at Sasa-Ginni-Gak Lodge and 75% intensity at Fishing Lake Lodge to provide fork length, weight and age information. Dorsal spines and otoliths from walleye, and operculum and pelvic fins from the northern pike were removed for aging purposes.

Analytical procedures for creel census data were as detailed by Valiant and Smith (1979), modified by the use of weekly periods as sample blocks. Each sample period was adjusted to a seven-day duration. The data for Sasaginnigak Lake was stratified to reduce the variability due to obvious differences in the June and July-August samples. The small number of samples obtained from Fishing Lake prohibited the use of stratification in the analysis for this lake.

Otoliths were used as the primary hard structure in determining walleye ages, according to Erickson (1979). Similarly, operculum ages were used for northern pike, as recommended by Zacharias (in prep.). Statistical analyses followed Snedecor and Cochran (1967).

The lodge owners at Sasa-Ginni-Gak Lodge and Fishing Lake Lodge provided information on angling seasons, occupancy rates and angler characteristics necessary for analysis of the data.

RESULTS

The summer angling season at Sasa-Ginni-Gak and Fishing Lake Lodges runs approximately from the May long weekend until the third week in September.

Maximum capacity at Sasa-Ginni-Gak Lodge is 45 anglers per day. In 1979, the average occupancy rate was 49%, ranging from 100% during the last week of May and all of June, to 0-20% during most of July and August (N. Zierk pers. comm.). Total number of occupants for the season was 591. Occupancy rates at Fishing Lake Lodge ranged from 40-60% during the 1979 season, with a total of 251 occupants (R. Treacy pers. comm.).

Walleye (Stizostedion vitreum vitreum) and northern pike (Esox lucius) were the primary angling species harvested in both lakes.

A. Creel Census Estimates

Creel census estimates for walleye and northern pike are given in Table 1 for Sasaginnigak Lake and Table 2 for Fishing Lake. Production of each species is represented by the numbers and round weight of fish kept by the angler. The number of fish caught per unit effort, expressed in both angler-hours and angler-days, is indicative of the angling success of the lake. A summary of the creek census data used to derive these figures is contained in Appendix B.

Percentages of fish kept and released, expressed in terms of the total fish caught, and the percentage of the fish kept that were consumed as shore lunches are given in Tables 3 and 4 for each respective lake.

B. Population Characteristics of Angling Species

A total of 440 walleye and 211 northern pike were sampled from Sasaginnigak Lake. The data analysis is summarized in Tables 5 and 6. Age-specific mean lengths and weights were used to determine the size range and length-age growth relationship (Fig. 4 and 5) and the length-weight relationship (Table 7, Figs. 6 and 7) for each species. Growth of walleye and northern pike is positively allometric. The walleye sampled ranged from four to twenty-four years in age. The age-frequency distribution for walleye is leptokurtic and positively skewed, with the seven to nine year age classes dominant (Fig. 8). Three to sixteen year old pike were sampled. The pike age composition is also leptokurtic and

Table 1. Creel census estimates for Sasaginnigak Lake.

Walleye

	No. of fish caught ± 2 S.E.	No. of fish kept ± 2 S.E.	Wt. of fish kept (kg.) ± 2 S.E.	Angler-Hours	No. of fish caught/a-h*	No. of fish kept/a-h	No. of fish kept/a-d**	Wt. of fish kept (kg.)/a-d
June	5042 ± 1185	2478 ± 642	1792 ± 464	8337	0.60	0.30	2.07	1.48
July-August	1803 ± 739	1030 ± 296	723 ± 208	2484	0.73	0.41	3.15	2.25
TOTAL	6845 ± 1397	3508 ± 707	2514 ± 508	10821	0.63	0.32	2.72	1.94

Northern Pike

	No. of fish caught ± 2 S.E.	No. of fish kept ± 2 S.E.	Wt. of fish kept (kg.) ± 2 S.E.	Angler-Hours	No. of fish caught/a-h	No. of fish kept/a-h	No. of fish kept/a-d	Wt. of fish kept (kg.)/a-d
June	2384 ± 583	1076 ± 317	2310 ± 766	8337	0.29	0.13	.90	1.88
July-August	833 ± 303	460 ± 126	779 ± 213	2484	0.34	0.19	1.47	3.07
TOTAL	3217 ± 657	1536 ± 341	3089 ± 795	10821	0.30	0.14	1.24	2.59

*Angler-hour.
**Angler-day.

Table 2. Creel census estimates for Fishing Lake.

Walleye

	No. of fish caught ± 2 S.E.	No. of fish kept ± 2 S.E.	Wt. of fish kept (kg.) ± 2 S.E.	Angler-Hours	No. of fish caught/a-h*	No. of fish kept/a-h	No. of fish kept/a-d**	Wt. of fish kept (kg.)/a-d
June, July, August (TOTAL)	3990 ± 5164	3355 ± 3068	2846 ± 2604	5466	0.73	0.62	3.81	3.02

Northern Pike

	No. of fish caught ± 2 S.E.	No. of fish kept ± 2 S.E.	Wt. of fish kept (kg.) ± 2 S.E.	Angler-Hours	No. of fish caught/a-h	No. of fish kept/a-h	No. of fish kept/a-d	Wt. of fish kept (kg.)/a-d
June, July, August (TOTAL)	1799 ± 2595	1470 ± 1549	4669 ± 4919	5466	0.33	0.27	.93	3.09

*Angler-hour.

**Angler-day.

Table 3. Percentages of angler's catch kept, released or consumed during sampling periods at Sasaginnigak Lake.

	June 1-7	June 15-21	Stratum 1	July 16-22	July 24-29	August 8-15	Stratum 2	OVERALL
Walleye								
% kept	50.6	48.1	49.5	76.3	63.1	47.6	59.0	51.2
% released	49.4	51.9	50.5	23.7	36.9	52.4	41.0	48.8
% consumed*	38.2	46.8	41.7	56.3	56.9	37.2	50.3	43.5
Northern Pike								
% kept	46.5	43.2	45.1	79.2	62.2	37.3	55.3	46.9
% released	53.5	56.8	54.9	20.8	37.8	62.7	44.7	53.1
% consumed*	21.2	36.6	27.3	63.2	50.0	31.8	48.6	31.8

*Represents the percentage of the total fish kept that were consumed as shore lunches.

Table 4. Percentages of angler's catch kept, released or consumed during sampling periods at Fishing Lake.

	June 8-14	June 21-28	August 16-22	OVERALL
Walleye				
% kept	78.8	68.0	93.0	77.2
% released	21.2	32.0	7.0	22.8
% consumed*	27.2	45.6	27.5	32.2
Northern Pike				
% kept	34.2	65.9	60.7	45.5
% released	65.8	34.1	39.3	54.5
% consumed*	19.4	20.7	52.9	23.9

*Represents the percentage of the total fish kept that were consumed as shore lunches.

Table 5. Age-specific frequency, mean length, weight and condition factors of creel census walleye from Sasaginnigak Lake, 1979.

Age	Number	Percent	Mean Length ± 2 S.E. (mm)	Mean Weight ± 2 S.E. (g)	Mean Condition Factor
4	1	0.23	280.00	240.00	1.09
5	5	1.14	310.40 ± 17.04	336.00 ± 42.70	1.12
6	30	6.82	341.10 ± 12.78	435.33 ± 44.92	1.07
7	54	12.27	362.61 ± 11.00	527.96 ± 50.22	1.07
8	55	12.50	376.80 ± 10.08	578.91 ± 42.68	1.07
9	84	19.09	403.37 ± 7.94	727.44 ± 43.70	1.09
10	41	9.32	405.32 ± 10.64	719.39 ± 52.78	1.06
11	21	4.77	398.43 ± 16.32	704.29 ± 89.08	1.09
12	37	8.41	419.30 ± 21.28	824.59 ± 125.60	1.06
13	21	4.77	444.57 ± 22.02	959.52 ± 144.04	1.06
14	21	4.77	444.67 ± 19.60	925.24 ± 134.14	1.03
15	18	4.09	402.22 ± 20.40	711.72 ± 127.92	1.06
16	14	3.18	419.86 ± 25.06	790.36 ± 164.90	1.04
17	13	2.95	403.69 ± 16.26	680.00 ± 81.36	1.03
18	12	2.73	445.67 ± 60.32	1106.25 ± 648.80	1.07
19	6	1.36	450.67 ± 81.18	1021.67 ± 594.96	1.02
20	1	0.23	426.00	880.00	1.14
21	2	0.45	513.00 ± 66.00	1420.00 ± 600.00	1.04
22	2	0.45	553.00 ± 262.00	2160.00 ±2760.00	1.08
23	1	0.23	474.00	1060.00	1.00
24	1	0.23	594.00	2320.00	1.11
	440	100.00	$\bar{\bar{x}}$= 398.80 ± 5.44	$\bar{\bar{x}}$= 714.43 ± 35.46	$\bar{\bar{x}}$= 1.07

Table 6. Age-specific frequency, mean length, weight and condition factors of creel census northern pike from Sasaginnigak Lake, 1979.

Age	Number	Percentage	Mean Length ± 2 S.E. (mm)	Mean Weight ± 2 S.E. (g)	Mean Condition Factor
3	4	1.90	458.00 ± 6.54	670.00 ± 73.94	0.70
4	15	7.11	498.40 ± 28.22	904.00 ± 189.74	0.71
5	32	15.17	551.50 ± 24.96	1190.00 ± 184.88	0.68
6	51	24.17	633.69 ± 27.20	1909.90 ± 265.56	0.69
7	56	26.54	674.36 ± 24.00	2262.14 ± 272.20	0.70
8	21	9.95	682.10 ± 42.60	2292.62 ± 493.08	0.67
9	7	3.32	734.86 ± 63.00	2877.14 ± 749.38	0.70
10	10	4.74	764.20 ± 49.12	3423.00 ± 742.24	0.74
11	9	4.27	752.44 ± 54.30	3185.56 ± 822.54	0.72
12	4	1.90	783.50 ± 192.84	4140.00 ± 2569.30	0.77
14	1	0.47	920.00	7840.00	1.01
16	1	0.47	930.00	6000.00	0.75
	211	100.00	$\bar{\bar{X}}$= 644.09 ± 16.24	$\bar{\bar{X}}$= 2085.36 ± 176.60	$\bar{\bar{X}}$= 0.70

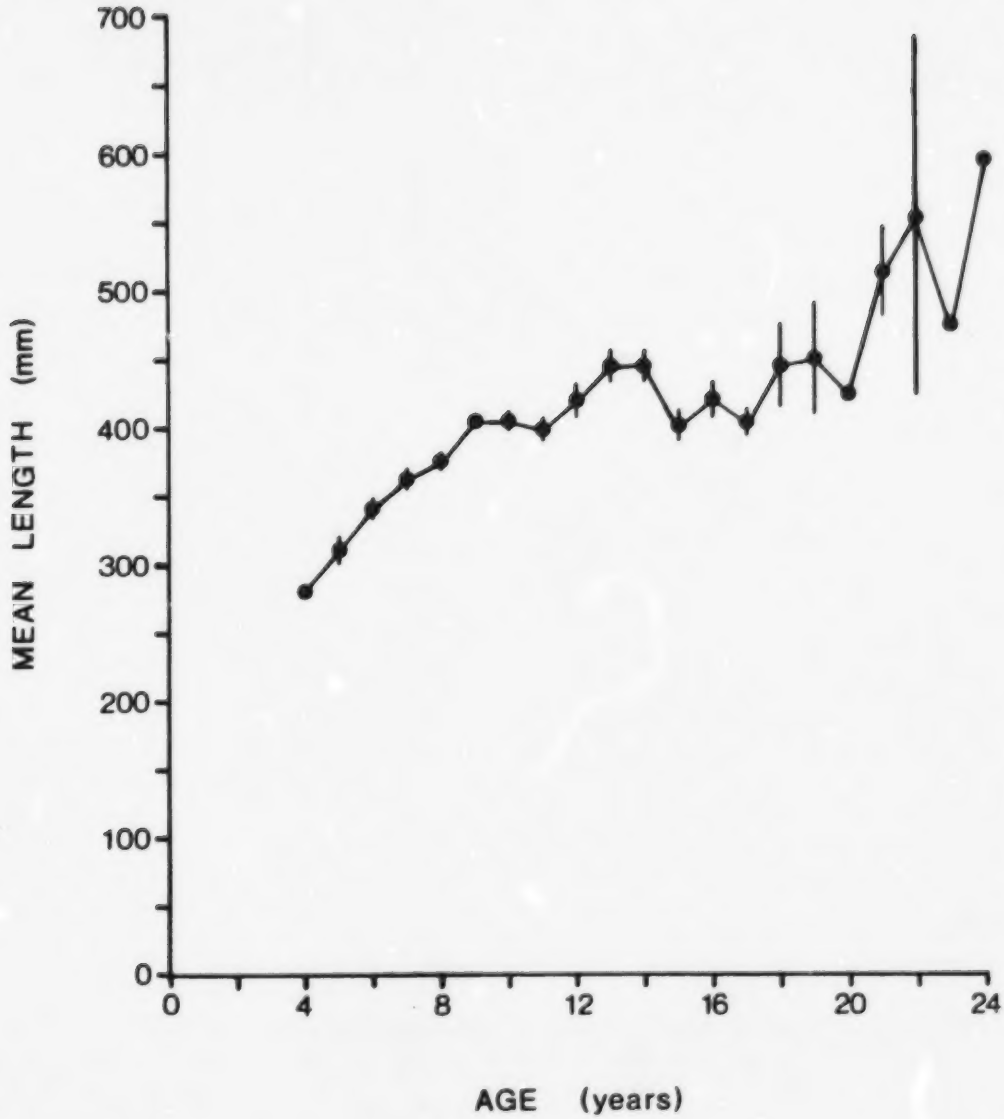

Fig. 4. Growth of creel census walleye from Sasaginnigak Lake, 1979.

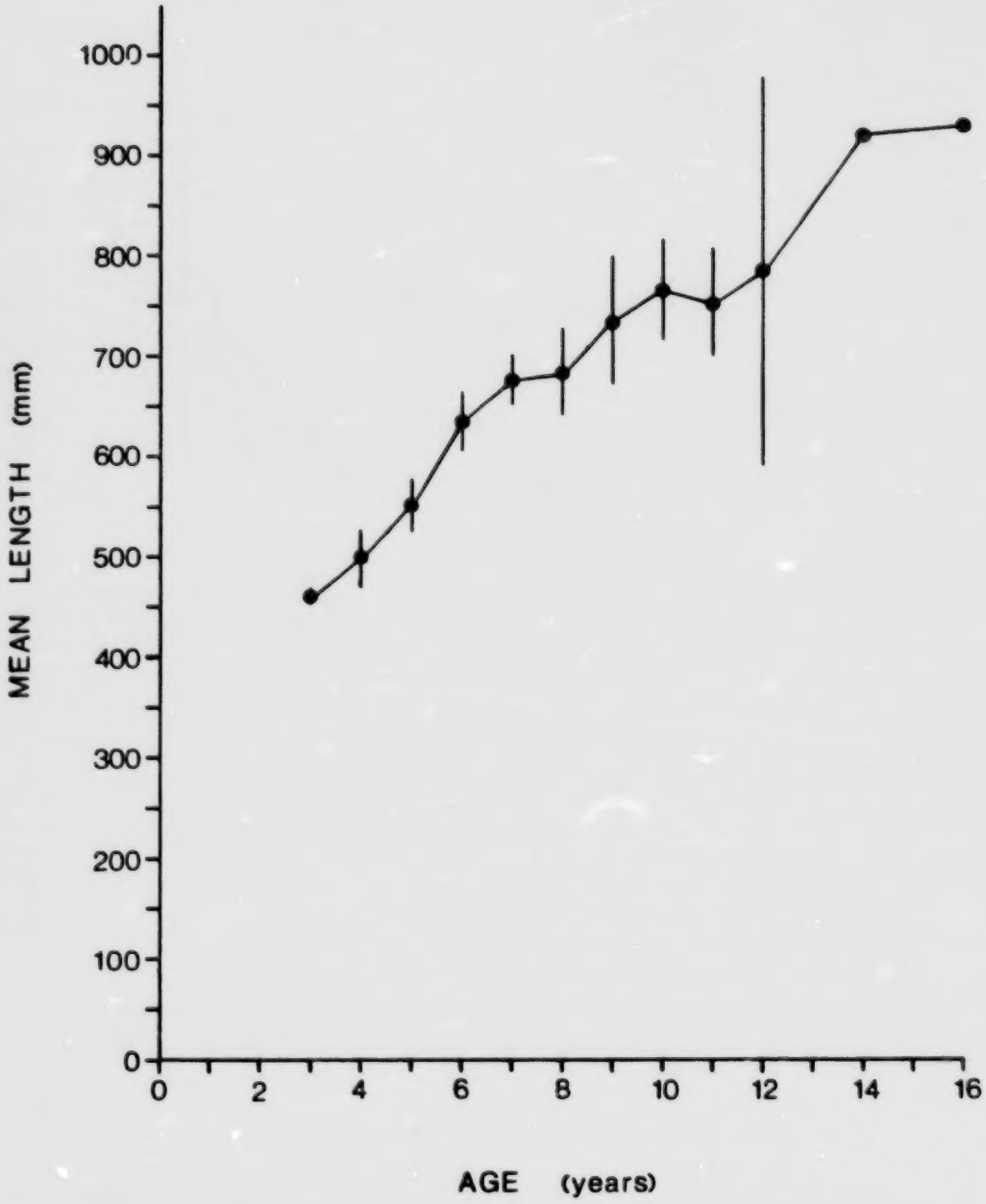

Fig. 5. Growth of creel census northern pike from Sasaginnigak Lake, 1979.

Table 7. Length-weight relationships of walleye and northern pike at Sasaginnigak and Fishing Lakes.

Lake	Species	Linear Equation	Correlation Coefficient
Sasaginnigak	Walleye	log (weight) = 11.571 + 3.026 log (length)	0.983
	Northern Pike	log (weight) = 13.080 + 3.197 log (length)	0.994
Fishing	Walleye	log (weight) = 10.942 + 2.924 log (length)	0.973
	Northern Pike	log (weight) = 12.324 + 3.083 log (length)	0.984

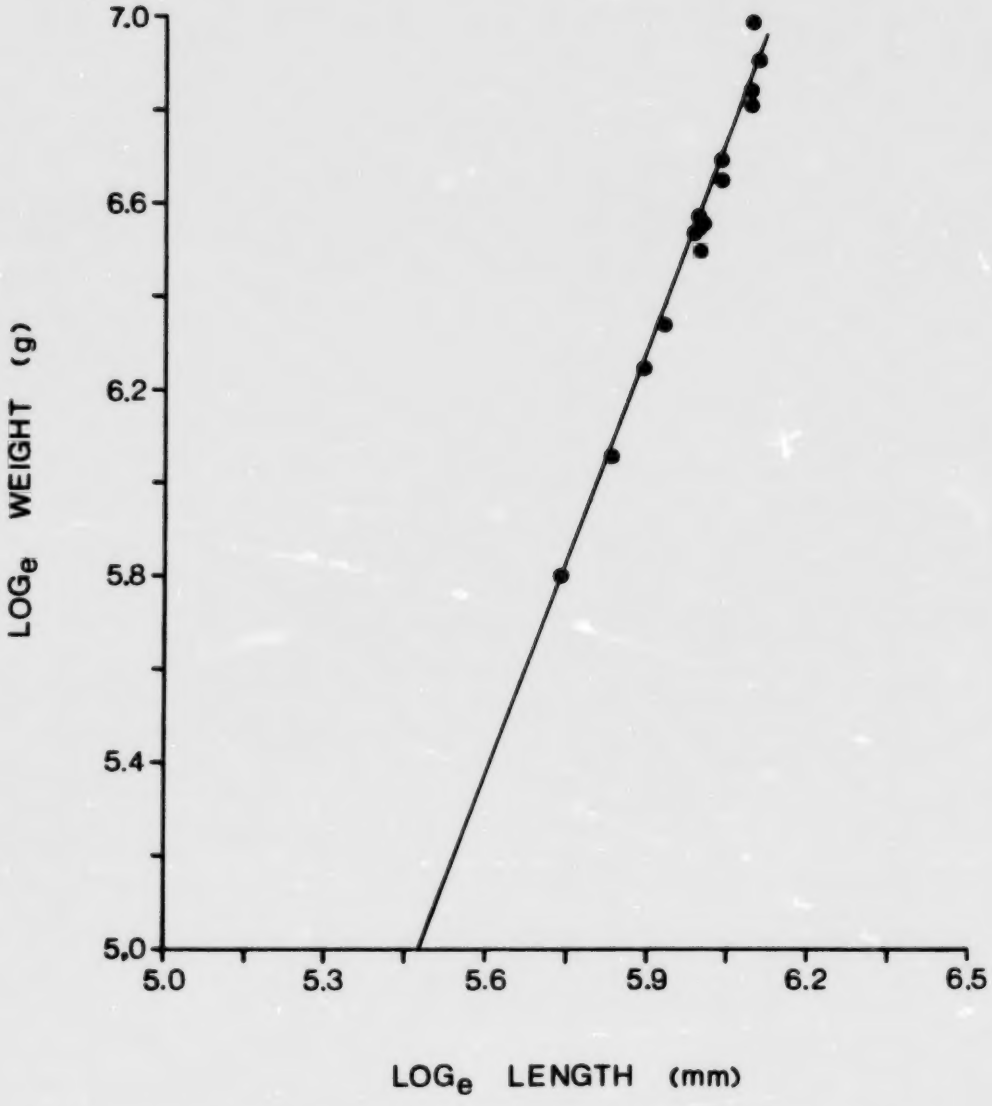

Fig. 6. Length-weight relationship of creel census walleye from Sasaginnigak Lake, 1979.

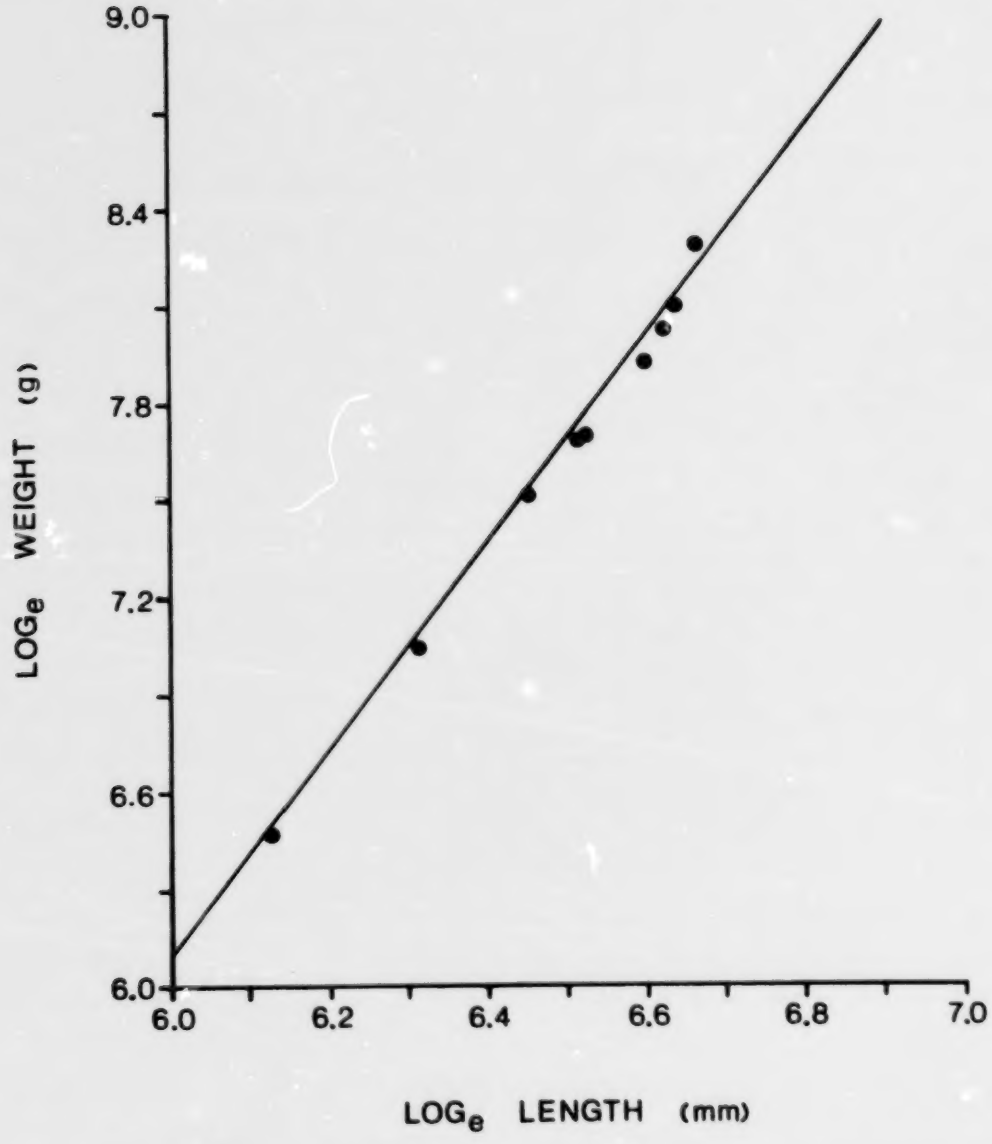

Fig. 7. Length-weight relationship of creel census northern pike from Sasaginnigak Lake, 1979.

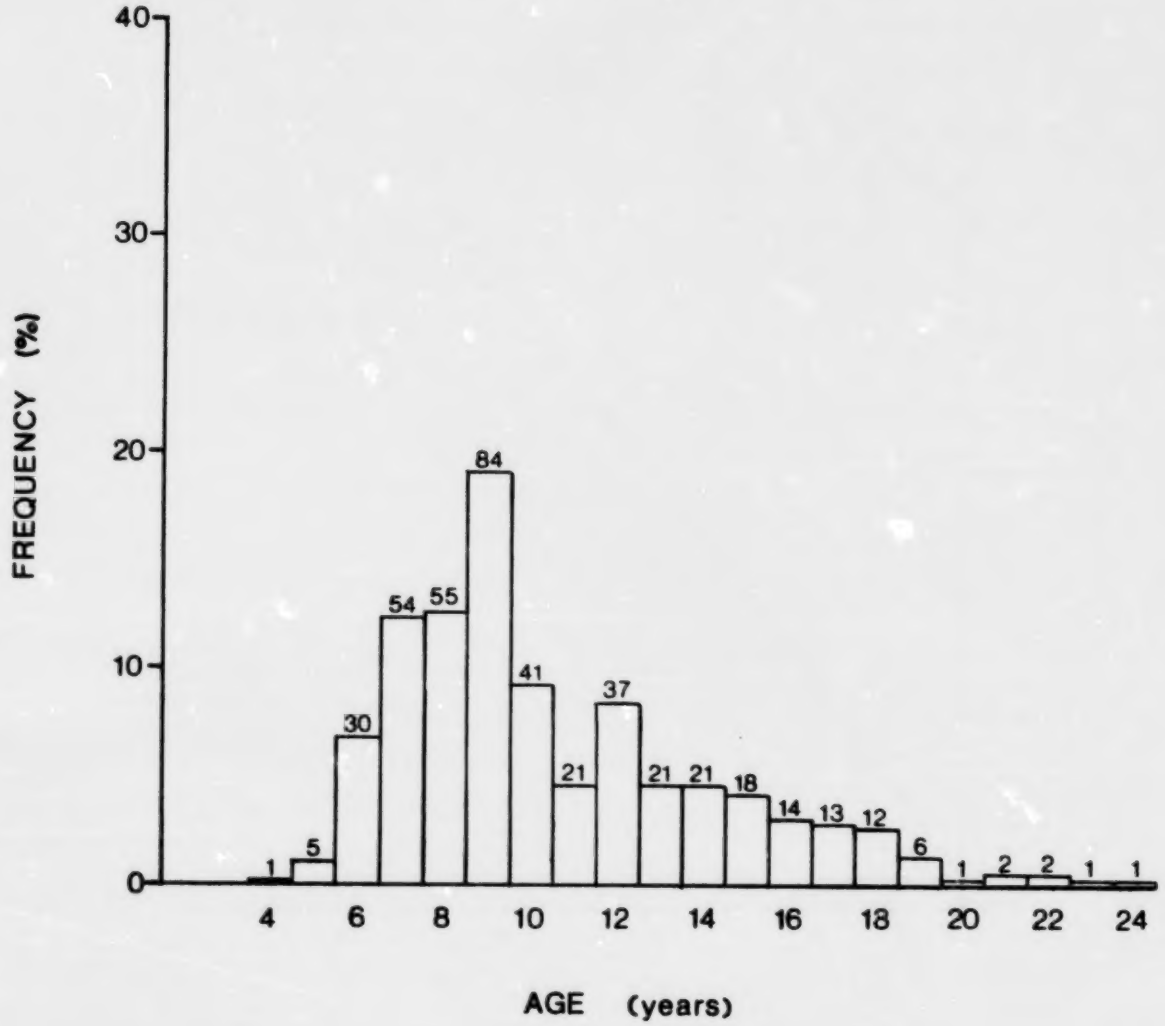

Fig. 8. Age composition of creel census walleye from Sasaginnigak Lake, 1979. The numbers above each bar denote the number of fish in each age class.

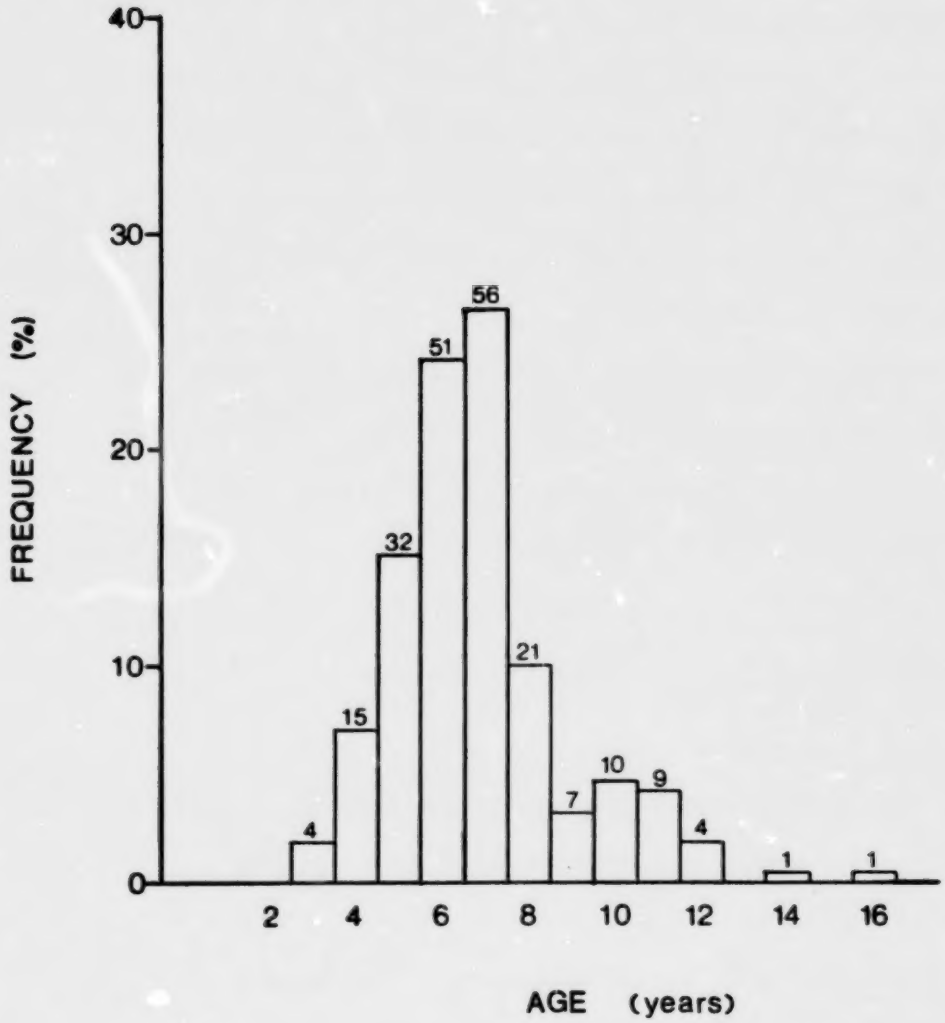

Fig. 9. Age composition of creel census northern pike from Sasaginnigak Lake, 1979. The numbers above each bar denote the number of fish in each age class.

positively skewed, dominated by the six and seven year age classes (Fig. 9).

At Fishing Lake, a total of 245 walleye and 101 northern pike were sampled. The data analysis is summarized in Tables 8 and 9. Figs. 10 and 11 illustrate the size range and length-age growth relationship for each species. The length-weight relationships (Table 7, Figs. 12 and 13) show walleye growth to be negatively allometric, while northern pike growth is positively allometric. The walleye sampled ranged from seven to twenty-three years in age. The age-frequency distribution, dominated by nine and ten year olds, is leptokurtic and positively skewed (Fig. 14). Four to fifteen year old pike were sampled. The age composition is again leptokurtic and positively skewed, with six to eight year olds dominant (Fig. 15).

C. Demographics of Anglers

1) Place of Residence of Anglers

Place of residence of the anglers interviewed is given in Table 10 for both lodges and on an overall basis. Angling activity was dominated by residents of the north-central United States, particularly those from Illinois, Iowa and Minnesota. Canadian anglers were restricted to residents of Winnipeg frequenting Sasaginnigak Lodge.

Table 8. Age-specific frequency, mean length, weight and condition factors of creel census walleye from Fishing Lake, 1979.

Age	Number	Percentage	Mean Length ± 2 S.E. (mm)	Mean Weight ± 2 S.E. (g)	Mean Condition Factor
7	2	0.82	361.00 ± 2.00	530.00 ± 20.00	1.13
8	9	3.67	388.67 ± 14.66	647.78 ± 69.02	1.10
9	63	25.71	405.81 ± 8.46	750.63 ± 45.52	1.11
10	70	28.57	407.37 ± 7.66	753.00 ± 43.26	1.10
11	2	0.82	401.00 ± 34.00	710.00 ± 100.00	1.11
12	12	4.90	425.50 ± 24.34	839.17 ± 144.42	1.07
13	19	7.76	428.63 ± 16.44	888.42 ± 127.00	1.10
14	10	4.08	425.60 ± 17.44	877.00 ± 127.26	1.13
15	6	2.45	397.33 ± 30.82	721.67 ± 185.72	1.12
16	7	2.86	427.14 ± 33.26	894.29 ± 195.32	1.13
17	11	4.49	436.36 ± 26.36	927.27 ± 193.14	1.08
18	11	4.49	427.64 ± 11.32	848.18 ± 57.90	1.08
19	16	6.53	427.38 ± 17.70	870.00 ± 103.56	1.10
20	3	1.22	420.00 ± 46.14	823.33 ± 166.66	1.12
21	2	0.82	404.00 ± 60.00	790.00 ± 280.00	1.19
23	1	0.41	480.00	1180.00	1.07
	245	100.00	$\bar{\bar{X}}$= 413.39 ± 4.50	$\bar{\bar{X}}$= 791.49 ± 26.82	$\bar{\bar{X}}$= 1.10

Table 9. Age-specific frequency, mean length, weight and condition factors of creel census northern pike from Fishing Lake, 1979.

Age	Number	Percentage	Mean Length ± 2 S.E. (mm)	Mean Weight ± 2 S.E. (g)	Mean Condition Factor
4	3	2.97	563.33 ± 65.38	1276.67 ± 398.72	0.70
5	7	6.93	656.86 ± 40.80	2088.57 ± 401.80	0.72
6	18	17.82	632.44 ± 42.80	2055.56 ± 508.98	0.76
7	20	19.80	770.30 ± 50.70	3775.00 ± 781.66	0.77
8	24	23.76	775.17 ± 48.22	3782.50 ± 740.34	0.75
9	11	10.89	773.09 ± 56.02	3337.27 ± 812.96	0.69
10	5	4.95	723.20 ± 107.88	2908.00 ± 1739.36	0.69
11	8	7.92	828.25 ± 54.12	4353.75 ± 1188.00	0.74
12	2	1.98	854.00 ± 164.00	4603.00 ± 3026.00	0.71
13	1	0.99	992.00	6900.00	0.71
14	1	0.99	968.00	6710.00	0.74
15	1	0.99	916.00	5390.00	0.70
	101	100.0	$\bar{\bar{x}}$= 742.69 ± 24.96	$\bar{\bar{x}}$= 3326.89 ± 353.52	$\bar{\bar{x}}$= 0.74

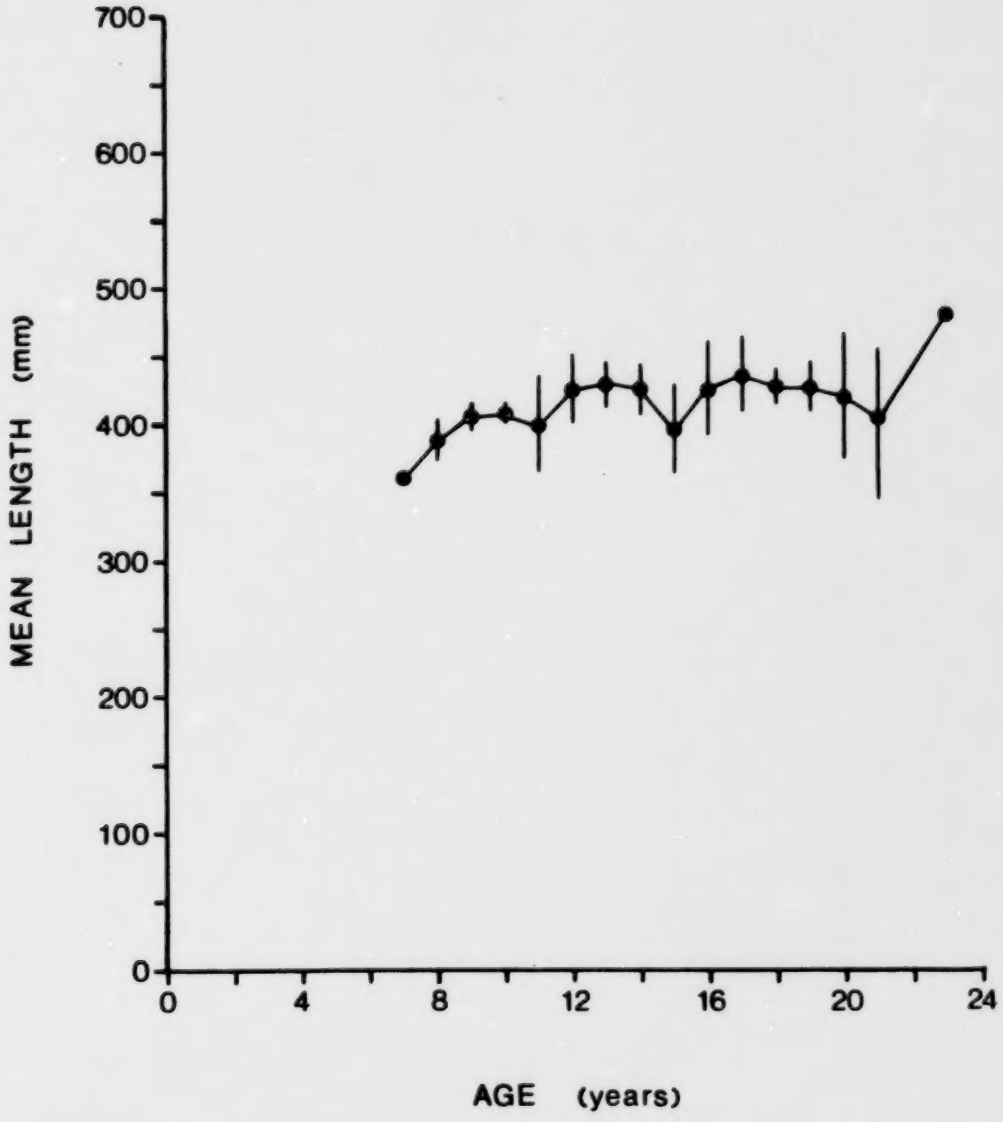

Fig. 10. Growth of creel census walleye from Fishing Lake, 1979.

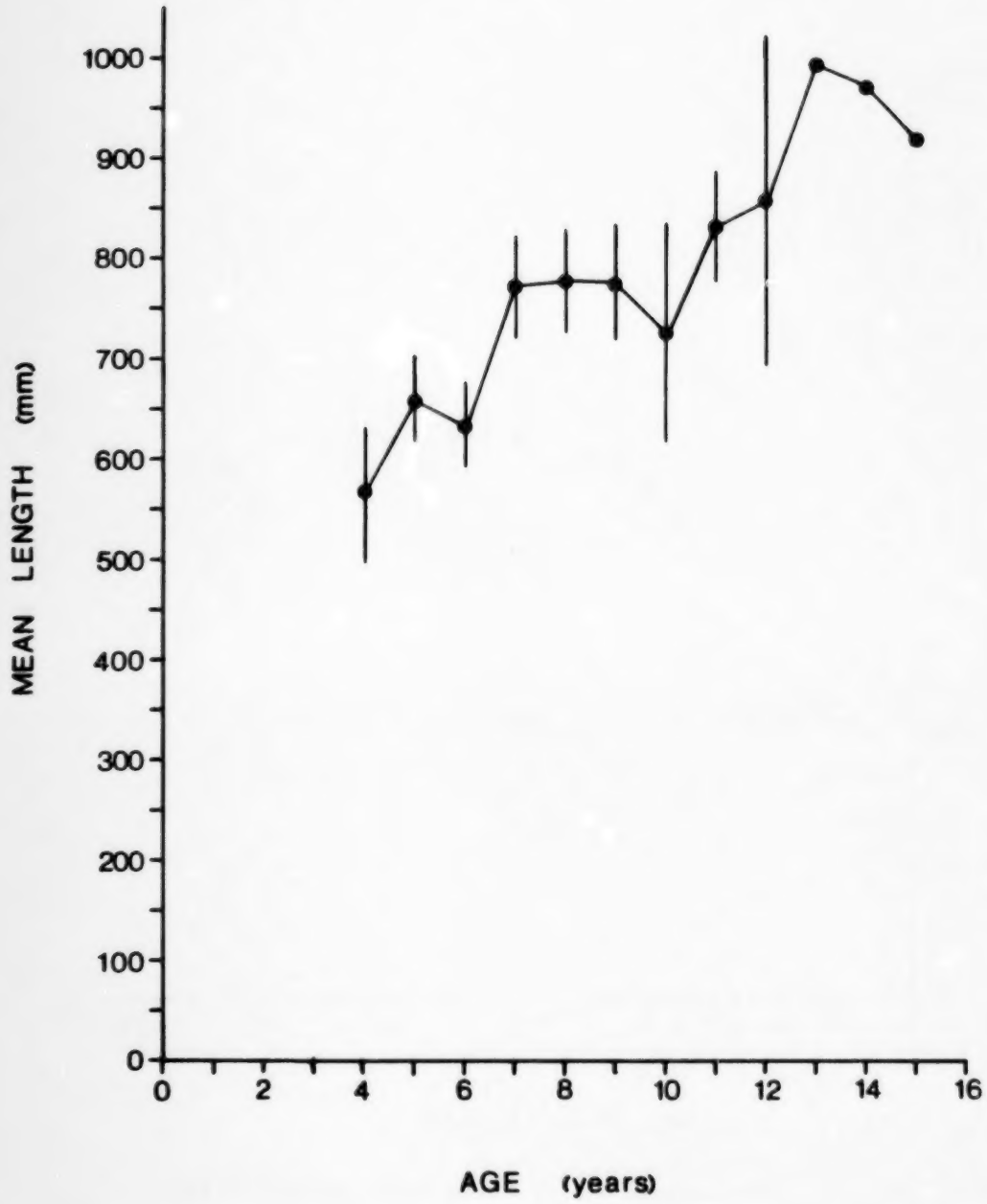

Fig. 11. Growth of creel census northern pike from Fishing Lake, 1979.

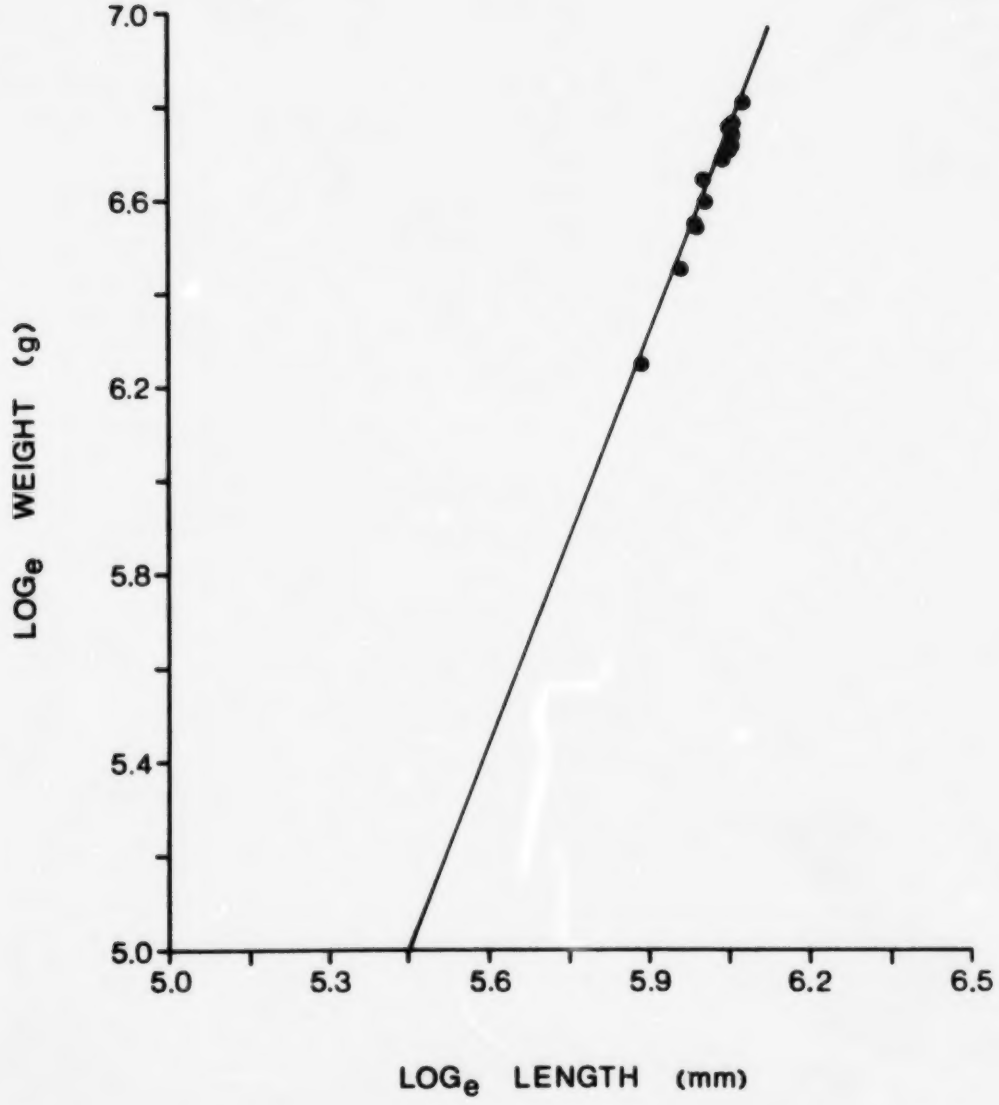

Fig. 12. Length-weight relationship of creel census walleye from Fishing Lake, 1979.

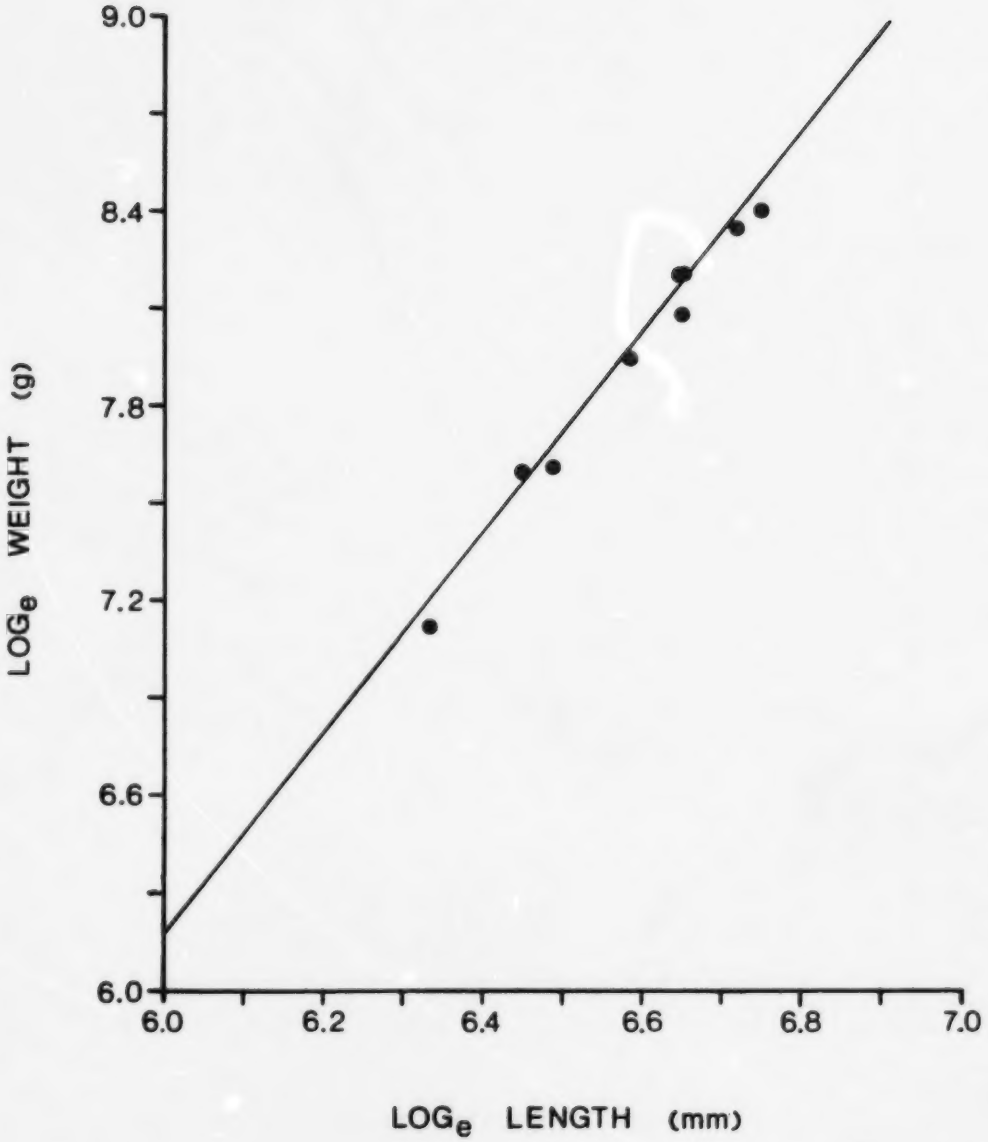

Fig. 13. Length-weight relationship of creel census northern pike from Fishing Lake, 1979.

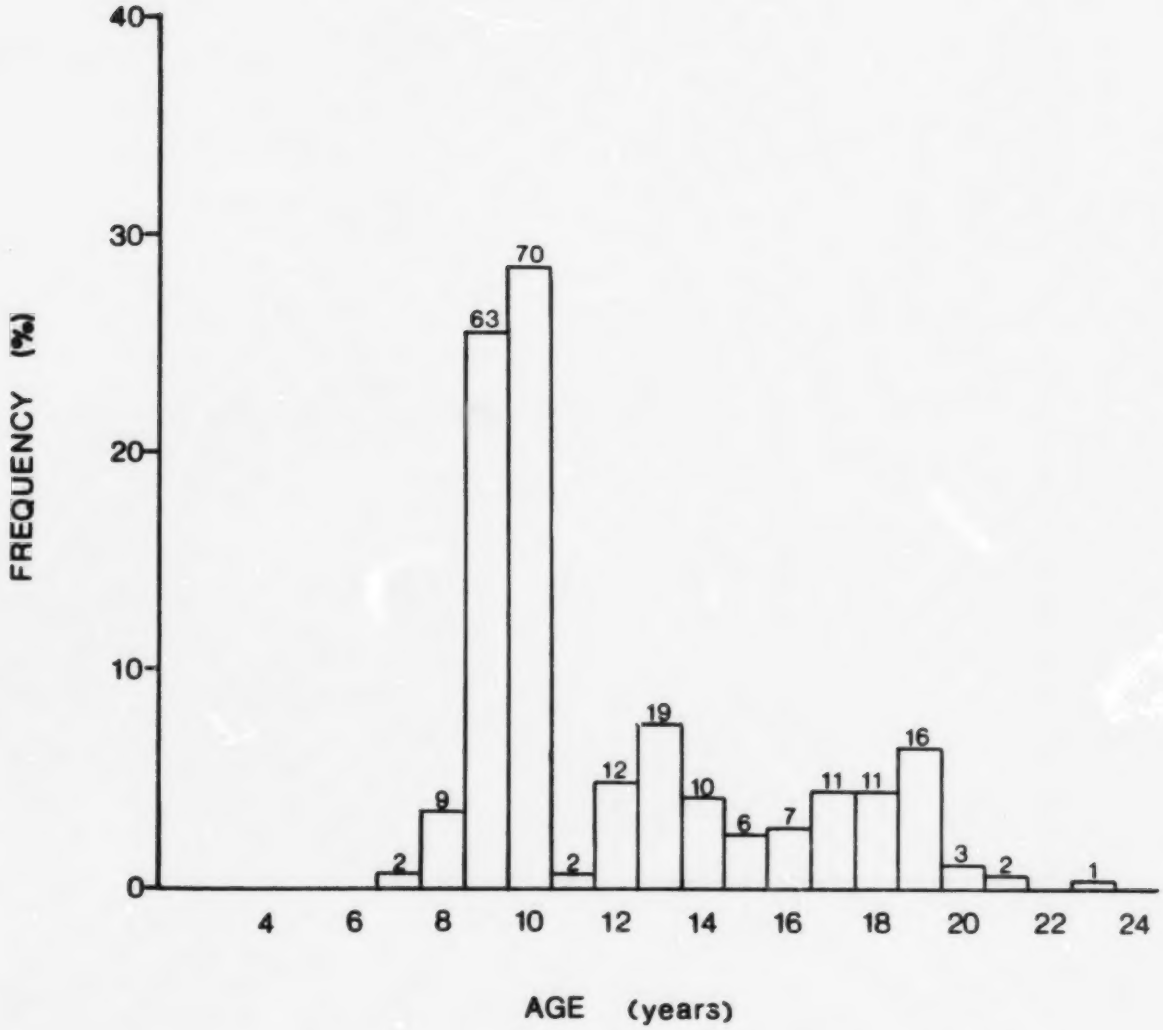

Fig. 14. Age composition of creel census walleye from Fishing Lake, 1979. The numbers above each bar denote the number of fish in each age class.

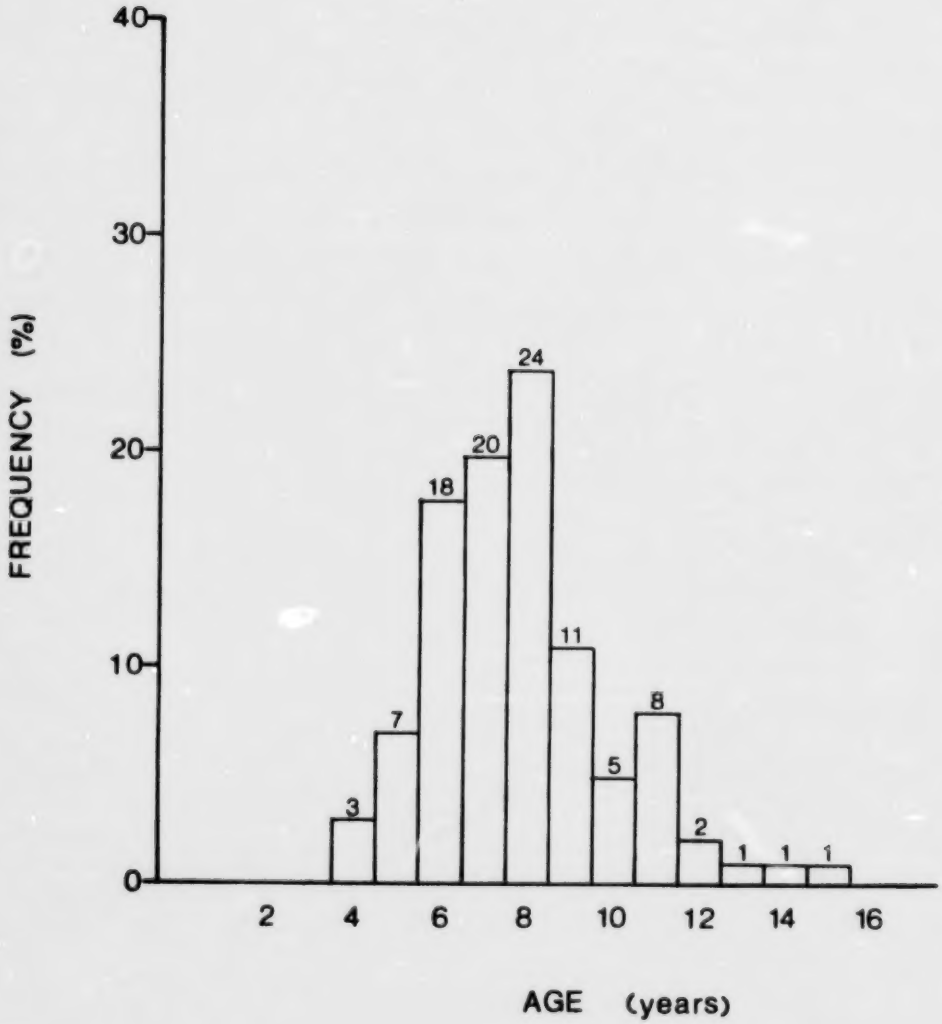

Fig. 15. Age composition of creel census northern pike from Fishing Lake, 1979. The numbers above each bar denote the number of fish in each age class.

Table 10. Place of residence of anglers.

Place of Residence	Sasa-Ginni-Gak Lodge		Fishing Lake Lodge		Overall	
	No.	%	No.	%	No.	%
Arizona	1	.4			1	.4
California			1	2.1	1	.4
Florida	2	.9	4	8.5	6	2.1
Georgia	1	.4			1	.4
Illinois	47	20.2	15	31.9	62	22.1
Indiana	1	.4			1	.4
Iowa	45	19.3	2	4.3	47	16.8
Kansas	1	.4	3	6.4	4	1.4
Kentucky	2	.9			2	.7
Michigan	1	.4	1	2.1	2	.7
Minnesota	36	15.5	11	23.4	47	16.8
Missouri	15	6.4			15	5.4
Nebraska	16	6.9			16	5.7
New York	1	.4	1	2.1	2	.7
North Dakota	4	1.7			4	1.4
Ohio			3	6.4	3	1.1
South Dakota	2	.9	2	4.3	4	1.4
Texas	9	3.9			9	3.2
Washington	4	1.7			4	1.4
Wisconsin	12	5.1	4	8.5	16	5.7
Winnipeg	33	14.2			33	11.8
TOTAL	233	100.0	47	100.0	280	100.0

2) Occupations of Anglers

This section of the census was conducted to determine the economic class structure of anglers utilizing lodge facilities. As illustrated in Table 11, anglers were equally comprised of professional and trades people at Sasaginnigak Lodge, and on a combined basis for both lodges. At Fishing Lake Lodge, the majority of guests were retired or in the trades.

3) Opinion of Angling Quality

Opinion of angling quality is an arbitrary judgement by the individual angler. Three possible factors influencing this decision were identified prior to the study and incorporated into the creel census questionnaire.

(a) Previous angling experience

In determining the effect of previous fishing experience on opinion of angling quality, it was first necessary to ascertain if salt-water experience was entering the analysis. A 2 x 2 contingency table was used to compare the presence or absence of salt-water experience with high or medium-low opinions of angling quality. The differences were not significant. As a result, all types of angling experience were included in the computations.

The degree of experience was then subjectively ranked from A to E, as indicated in Table 12. A two-way analysis of variance revealed significant differences between the degree of previous fishing experience and opinion of angling quality.

Table 11. Occupations of anglers.

	Occupational Class	No.	%
Sasa-Ginni-Gak Lodge	Professional	72	34.6
	Trade	71	34.1
	Farming	10	4.8
	Retired	22	10.6
	Student	33	15.9
	TOTAL	208	100.0
Fishing Lake Lodge	Professional	9	17.7
	Trade	18	35.3
	Farming	0	0.0
	Retired	20	39.2
	Student	4	7.8
	TOTAL	51	100.0
Overall	Professional	81	31.3
	Trade	89	34.4
	Farming	10	3.8
	Retired	42	16.2
	Student	37	14.3
	TOTAL	259	100.0

Table 12. Rating scheme of previous angling experience.

A. no previous experience

B. local experience only (with respect to angler's place of residence)

C. experience throughout North America, including some experience at northern Canadian lakes

D. experience mainly at northern Canadian lakes, 1 - 2 years previous

E. experience mainly at northern Canadian lakes, more than three years previous

(b) Average catch per angler-hour

The average catch per angler-hour was calculated as a function of opinion of angling quality for walleye and northern pike, and for all fish species. The results are given for each lodge and on an overall basis in Table 13. Analysis of variance revealed significant differences between opinion of angling quality for all species except northern pike at Fishing Lake, perhaps due to the small sample size.

(c) Average weight of fish kept

The average weight of the fish retained for each species as it corresponds to opinion of angling quality was calculated for both lakes and on an overall basis (Table 14). There was no relationship between these two factors.

D. Expenditures of Anglers

Expenses incurred by anglers were evaluated by the gross expenditure method, encompassing all costs of transportation, food, lodging and incidental expenses directly pertaining to use of the resource. The breakdown of these expenditures for guests of Sasa-Ginni-Gak and Fishing Lake Lodges is given in Appendix C. Total expenditures of anglers at Sasa-Ginni-Gak Lodge was estimated at $509,000, with an average angler expenditure of $700. Of this, approximately $265,000 was spent in Manitoba. Anglers at Fishing Lake Lodge expended an estimated $376,500, of which approximately $301,200 was spent in Manitoba. The average expenditure per angler was estimated at $1,500.

Table 13. Average catch per angler-hour associated with opinion of angling quality.

Opinion of Angling Quality	Sasaginnigak Lake			Fishing Lake			Overall		
	Walleye	N. Pike	All fish	Walleye	N. Pike	All fish	Walleye	N. Pike	All fish
High	.94	.46	1.40	.81	.34	1.14	.91	.43	1.33
Medium	.85	.40	1.25	.63	.24	.86	.81	.37	1.18
Low	.42	.28	.70	.31	.21	.52	.39	.26	.66

Table 14. Average weight of fish kept (g.) associated with opinion of angling quality.

Opinion of Angling Quality	Sasaginnigak Lake		Fishing Lake		Overall	
	Walleye	N. Pike	Walleye	N. Pike	Walleye	N. Pike
High	687.56	1715.45	821.45	3925.42	789.99	3025.06
Medium	693.49	1567.88	965.29	2835.00	759.50	1893.71
Low	644.00	1914.12	892.36	2286.92	768.18	2139.53

DISCUSSION

An estimated 2513.8 kg. of walleye and 3088.7 kg. of northern pike were harvested by anglers from Sasaginnigak Lake during the 1979 sampling period. Harvests from Fishing Lake are estimated at 2847.7 kg. of walleye and 4668.7 kg. of pike.

These estimates represent production during June, July and August, and are not indicative of total annual harvest. Lodge operators have indicated that angling pressure and success during the last two weeks of May is comparable to that experienced in June. In September, it is slightly higher than the July-August period, but still below the June peak. Using this information, it is possible to extrapolate the total creel harvest for the 1979 summer angling season at approximately 3700 kg. of walleye and 4500 kg. of pike for Sasaginnigak Lake, and 4000 kg. of walleye and 6600 kg. of pike for Fishing Lake.

The above estimate of 8200 kg. accounts for the total annual production of Sasaginnigak Lake. Domestic consumption by the 217 residents of Pauingassi Indian Reserve at Fishing Lake is estimated at 4800 kg. based on the 22.2 kg. per person average obtained from research in six native communities in Manitoba (Peters and Wall 1979). Total annual production for this lake is thus approximately 15,400 kg.

The maximum sustainable yield (M.S.Y.) for Sasaginnigak Lake, estimated using Ryder's morphoedaphic index (Ryder 1965), is 3.54 kg. per hectare per year. The 1979 angler harvest accounts for 48% of the annual 17,180 kg. maximum. At Fishing Lake, the estimated

M.S.Y. is 3.00 kg. per hectare per year. The 1979 angler harvest represents 32% of this maximum, whereas annual production accounts for 46% of the M.S.Y.

Predictably, maximum harvest was recorded during the June sampling period at Sasaginnigak Lake. The conflicting increase in catch per angler-hour noted during the July-August period was not significant ($P < 0.01$).

Individual angler harvest was 4.53 kg. round weight per day at Sasaginnigak Lake (Table 1) and 6.11 kg. round weight per day at Fishing Lake (Table 2).

Approximately 50% of the fish caught at Sasaginnigak Lake were retained by the anglers, with a slight increase in this proportion during July. The majority of walleye caught at Fishing Lake were kept, particularly in August. Although most pike were released during June, these proportions are reversed throughout July and August. Reduced fishing yield in this period may account for the increase in the percentage of fish kept. The preference for keeping more walleye than pike exhibited at Fishing Lake was also noted by Lustig (1979) at lodges in northern Saskatchewan.

The 24% to 44% of fish kept that were consumed as shore lunches is considerably higher than the 9% to 17% figure given by Lustig (1979). An average of 1.5 kg. round weight of fish per angler per day was consumed, as compared to the 1.1 kg. estimate for Gods Lake (Hagenson and O'Connor 1978) and the 2.3 kg. average used for Molson Lake (Kotack 1974).

Regier (1966) noted the difficulty in making reliable inferences from a creel census sampling program to population dynamics, as this data usually reflects a definite selectivity of anglers for the largest, fastest growing fish. A comparison of the data analysis for walleye sampled under the creel census program (Table 5) and the lake inventory program (Table 15) at Sasaginnigak Lake in 1979 illustrates this selectivity with respect to age composition for the same population of fish. The age-frequency distribution of the lake inventory walleye is concentrated between 4 to 9 years, whereas creel census walleye are primarily in the 6 to 12 year category. There are, however, no significant differences between the mean lengths and weights at each age, or between the overall mean length and weight ($P < 0.01$). The population characteristics derived from the creel census may thus closely approximate the true population dynamics of walleye and northern pike at the two lakes.

A review of Master Angler Awards since 1975 (Tables 16 and 17) gives some indication of population trends for both species. The number of qualifying walleye (mimimum eligible weight of 3.60 kg.) has increased over the last two years at Sasaginnigak Lake, whereas there have been no awards at Fishing Lake since 1976. Although an increase in minimum eligible weight for northern pike from 8.10 kg. to 9.00 kg. in 1978 makes it difficult to compare the number of awards and mean weight between years, it is nevertheless obvious

Table 15. Age-specific frequency, mean length, weight and condition factors for lake inventory walleye from Sasaginnigak Lake, 1979.

Age	Number	Percent	Mean Length ± 2 S.E. (mm)	Mean Weight ± 2 S.E. (g)	Mean Condition Factor
2	1	0.58	140.00	40.00	1.46
3	8	4.62	220.25 ± 9.18	95.00 ± 18.12	0.87
4	14	8.09	244.00 ± 17.15	140.00 ± 33.62	0.91
5	16	9.25	273.13 ± 16.46	203.13 ± 37.00	0.95
6	15	8.67	321.60 ± 16.60	324.67 ± 47.68	0.96
7	17	9.83	359.06 ± 16.02	457.06 ± 63.08	0.97
8	24	13.87	364.42 ± 13.58	493.33 ± 62.40	0.99
9	15	8.67	403.60 ± 26.90	672.33 ± 128.52	0.98
10	9	5.20	427.56 ± 38.00	803.89 ± 231.92	0.98
11	10	5.78	407.40 ± 41.58	694.50 ± 206.18	0.98
12	8	4.62	475.50 ± 52.32	1127.50 ± 332.24	1.01
13	6	3.47	403.67 ± 16.76	667.50 ± 96.80	1.01
14	8	4.62	440.50 ± 38.52	892.50 ± 292.06	1.00
15	3	1.73	420.00 ± 62.10	736.67 ± 263.40	0.98
16	1	0.58	360.00	460.00	0.99
17	9	5.20	488.67 ± 33.84	1188.89 ± 304.90	0.98
18	2	1.16	590.50 ± 131.00	2400.00 ± 1700.00	1.11
19	3	1.73	515.33 ± 74.10	1400.00 ± 550.76	1.00
20	1	0.58	406.00	700.00	1.05
21	1	0.58	418.00	740.00	1.01
Unknown	2	1.16	225.00 ± 10.00	100.00 ± 00.00	0.88
	172	100.00	$\bar{\bar{X}}$= 364.78 ± 14.06	$\bar{\bar{X}}$= 571.85 ± 69.00	$\bar{\bar{X}}$= 0.97

Table 16. Master Angler Awards for walleye and northern pike from Sasaginnigak Lake, 1975-1979.

Year	Walleye		Northern Pike	
	No. of Awards	Mean Weight (kg.)	No. of Awards	Mean Weight (kg.)
1975	2	3.69	16	8.61
1976	3	4.35	7	8.72
1977	3	3.79	9	8.83
1978	6	4.31	8	9.25
1979	11	4.05	3	9.69

Table 17. Master Angler Awards for walleye and northern pike from Fishing Lake, 1975-1979.

Year	Walleye		Northern Pike	
	No. of Awards	Mean Weight (kg.)	No. of Awards	Mean Weight (kg.)
1975	2	4.04	14	9.44
1976	4	3.83	20	9.26
1977	0	0.00	13	9.01
1978	0	0.00	2	9.63
1979	0	0.00	0	0.00

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that the number of qualifying pike at Fishing Lake have declined drastically over the last two years. This decrease is further emphasized by the fact that Fishing Lake held the Manitoba record for northern pike at 18.51 kg. until 1977.

The demographic information compiled on anglers from Sasa-Ginni-Gak and Fishing Lake Lodges provides a general overview on the type of anglers frequenting Manitoba's fishing lodges. The majority of the anglers originated from the north-central United States, as was previously reported in the 1975 survey of sport angling in Manitoba (O'Connor 1978).

It is obvious from the differences in occupations shown in Table 11 and expenditures of the anglers surveyed that each lodge attracts a distinct type of clientele. The large proportion of retired people at Fishing Lake Lodge indicates that these anglers have a greater abundance of leisure time to devote to recreational pursuits. They also appear to be more affluent, with the average expenditure per angler more than twice that of the more economy motivated fishermen at Sasa-Ginni-Gak Lodge.

It is impossible to make decisive statements on the factors influencing the evaluation of angling quality because of the capricious nature of such opinions. Furthermore, angler assessment of fishing quality may be indirectly affected by other variables such as weather conditions, the aesthetics of the location, and companionship, which are beyond the scope of this study.

Of the factors considered, previous angling experience and catch per unit effort have a positive correlation with opinion of angling quality. A higher level of experience, particularly in the northern lakes, provides a comparative basis for a more accurate evaluation. Increased angler success results in the expected improvement in rating of angling quality.

The lack of correlation between the rating of angling quality and the weight of the fish kept suggests that this factor is of lesser importance for good angling in this area. A survey of anglers in Wyoming on the importance of various attributes of a quality fishing trip (Adams 1979) indicated that the chance to catch large fish rated as a lower priority, with the opportunity to relax outdoors being the primary objective of the trip for most anglers in that area. This may also be of significance on the two lakes studied here.

The catch per angler-hour averages in Table 13 may be modified into a range format to provide an evaluation scheme for angling quality (Table 18). This scheme differs from that established by Andrews in 1968, suggesting that the values defined by the anglers in this study more accurately reflect success standards for lakes on the east side of Lake Winnipeg. Using this evaluation system, the catch per angler-hour figures in Tables 1 and 2 indicate a medium level of angling quality for walleye and northern pike at both lakes.

Table 18. Evaluation scheme of angling quality based on catch per angler-hour, as defined by anglers at Sasaginnigak and Fishing Lakes, 1979.

Angling Quality	Species	
	Walleye	Northern Pike
High	0.87 →	0.41 →
Medium	0.61 - 0.86	0.32 - 0.40
Low	← 0.60	← 0.31

Angler expenditures were estimated using the gross expenditure method advocated by Nielson (1977) as the preferred method for valuation of a sport fisheries resource. The travel-cost approach was also incorporated into the overall expenditures to reflect differences between anglers where other expenses were equal. Expenditures were isolated as those wholly attributable to the angling experience under consideration, and do not include costs of equipment. The derived estimates place quantitative values on the sport angling revenue for this province, and once again illustrate the importance of Manitoba's fishing lodges as a valuable tourist resource.

Further creel census studies on other lakes on the east side of Lake Winnipeg would provide valuable additions to the baseline data in this report, and allow for a more comprehensive overview of this area.

RECOMMENDATIONS

1. The catch per unit effort evaluation scheme defined in this study be established as a representative range of opinion of angling quality for lakes on the east side of Lake Winnipeg.

2. Similar creel census be conducted on representative lakes in other regions of the province to establish angler success standards for these areas.

3. Additional research be done on determining those attributes of the angling experience that affect opinion of angling quality. This could be accomplished by the inclusion of more specific questions in future creel census studies, and through questionnaires addressed to both local and non-resident anglers.

4. Further comparisons be done between population parameters established through angler surveys and the lake inventory program.

5. The Lodge Development Formula be reviewed in light of the area-specific information presented in this study.

ACKNOWLEDGEMENTS

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LITERATURE CITED

Adams, S.W. 1979. Segmentation of a recreational fishing market: A canonical analysis of fishing attributes and party composition. Journal of Leisure Research 11:81-91.

Andrews, R.R. 1968. Angling Bulletin No. 1. Man. Dept. of Mines, Res. and Environ. Mgmt. 2pp.

Erickson, C.M. 1979. Age differences among three hard tissue structures observed in fish populations experiencing various levels of exploitation. Man. Dept. of Nat. Res. MS Rept. 79-47. 31 pp.

Hagenson, I. and J.F. O'Connor. 1978. A creel census of God's Lake, 1974 and 1975. Man. Dept. of Northern Affairs, Ren. Res. and Transp. Serv. Fisheries MS Rept. 78-57. 66 pp.

Kotack, D.N. 1974. An assessment of the Molson Lake commercial/ sport fishing controversy. M.Sc. Practicum, Natural Resource Institute, University of Manitoba, Winnipeg, Man. 92 pp.

Lustig, K.M. 1979. An analysis of catch and effort data from selected fishing lodges in northern Saskatchewan 1974-76. Dept. of Northern Sask. Fisheries Data Rept. 1. 100 pp.

Nielson, J.D. 1977. A profile of the Souris River sports fishery: Angler characteristics, angling pressure, success and harvest. M.Sc. Practicum, Natural Resource Institute, University of Manitoba, Winnipeg, Manitoba. 82 pp.

O'Connor, J.F. 1978. Survey of sport fishing in Manitoba in 1975. Man. Dept. of Ren. Res. and Transp. Serv. MS Rept. 78-21. 11 pp.

Peters, R. and C. Wall. 1979. Manitoba Fisheries Fact Book. Man. Dept. of Mines, Nat. Res. and Environ. Fisheries Branch. Vol. 1:10.

Regier, H.A. 1966. Fishermen and creel censuses. New York Coop. Fish. Unit mimeo. 10 pp.

Ryder, R.A. 1965. A method for estimating the potential fish production of north-temperate lakes. Trans. Am. Fish Soc. 94:214-218.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical Methods. 6th ed. Iowa State Univ. Press, Ames, Iowa. 593 pp.

Valiant, H. and T. Smith. 1979. Angler creel census in the Lake Winnipegosis, Waterhen, Lake Manitoba and Dauphin River areas in 1977 and 1978. Man. Dept. of Nat. Res. MS Rept. 79-68. 88 pp.

U.S. Dept. of Commerce. 1979. Survey of Current Business. Bureau of Economic Analysis, Washington D.C. Oct. 1979. Vol. 59, No. 10:21-22.

U.S. Dept. of Transportation. 1977. National Transportation Statistics. Washington D.C. Nov. 1977. p. 97-107.

APPENDIX A

CREEL CENSUS INFORMATION FORM

DATE _____ LODGE _____ CABIN # _____

# ANGLERS IN PARTY	PLACE OF RESIDENCE	OCCUPATION	OTHER FISHING EXPER. (AREAS FISHED)	OPINION OF ANGLING QUALITY H	M	L	

TIME SPENT ANGLING IN HOURS	PICKEREL			PIKE					
	CAUGHT	KEPT	CONSUMED	CAUGHT	KEPT	CONSUMED	CAUGHT	KEPT	CONSUMED

TIME SPENT ANGLING IN HOURS									
	CAUGHT	KEPT	CONSUMED	CAUGHT	KEPT	CONSUMED	CAUGHT	KEPT	CONSUMED

NOTES AND OBSERVATIONS: -

APPENDIX

CABIN # — It is important that we are able to keep separate the actual number anglers involved and don't double count individuals.

ANGLERS IN PARTY — This means persons actively engaged in fishing activities.

PLACE OF RESIDENCE — City and State or Province.

OCCUPATION — Doctor, Pipefitter, farmer, etc.

OTHER FISHING EXPERIENCE — Other areas that have been angled in North America or elsewhere. eg. God's Lake - for Lake Trout
Missouri River - Channel Cats

OPINION OF ANGLING QUALITY — H - High
M - Medium
L - Low

This of course will be relative to anglers other experiences.

CAUGHT — Means all fish landed by the angler. This would include fish released.

KEPT — This includes all fish retained by angler including those eaten for shore lunch or other meals.

CONSUMED — This would mean all fish actually eaten by the angler or party for shore lunches or any other meal. If for other than shore lunch please specify in Notes Section. eg. Breakfast
Lunch
Supper

TIME SPENT ANGLING IN HOURS — This means actual angling times, not including travelling to site, shore lunches, etc. Only that time spent with fishing gear in the water.

APPENDIX B

Table 1B. Summary of creel census data for Sasaginnigak Lake, 1979.

		STRATUM 1		STRATUM 2		
		June 1-7	June 15-21	July 16-22	July 24-29*	August 8-15*
Number of Anglers**		348	249	18	45.50	44.63
Total Angler Hours		2441	1727.5	126	345.33	273.88
Number of Walleye	kept	733	506	71	143.50	105.88
	released	717	545	22	84.00	116.37
	caught	1450	1051	93	227.50	222.25
	consumed	280	237	40	81.67	39.38
Number of N. Pike	kept	325	213	38	65.33	38.50
	released	374	280	10	39.67	64.75
	caught	699	493	48	105.00	103.25
	consumed	69	78	24	32.67	12.25
Number of Perch	caught	1				

*Figures have been adjusted to a seven-day week.

**Expressed as the cumulative sum of the number of anglers per day.

TABLE 2B

CREEL CENSUS DATA FOR SASAGINNIGAK LAKE, 1979

June 1 - 7, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
June 1	50	362	Walleye	247	.68	128	.35	57
			N. Pike	184	.51	67	.19	21
				431	1.19	195	.54	78
June 2	41	316	Walleye	126	.40	60	.19	13
			N. Pike	96	.30	21	.07	3
				222	.70	81	.26	16
June 3	51	268	Walleye	188	.70	117	.44	39
			N. Pike	88	.33	45	.17	15
				276	1.03	162	.61	54
June 4	51	371	Walleye	171	.51	99	.27	22
			N. Pike	98	.26	53	.14	9
				269	.77	152	.41	31
June 5	57	391	Walleye	391	1.00	180	.46	69
			N. Pike	69	.18	44	.11	11
				460	1.18	224	.57	80
June 6	49	360	Walleye	91	.25	42	.12	30
			N. Pike	64	.18	34	.09	6
				155	.43	76	.21	36
June 7	49	373	Walleye	236	.63	107	.29	50
			N. Pike	100	.27	61	.16	4
				336	.90	168	.45	54
Week	348	2,441	Walleye	1,450	.60	733	.30	280
			N. Pike	699	.29	325	.13	69
				2,149	.89	1,058	.43	349

June 15 - 21, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
June 15	40	316	Walleye	173	.55	42	.13	23
			N. Pike	113	.36	42	.13	21
				286	.91	84	.26	44
June 16	48	313	Walleye	128	.41	58	.19	26
			N. Pike	66	.21	31	.10	12
				194	.62	89	.29	38
June 17	41	240.5	Walleye	134	.56	92	.38	45
			N. Pike	57	.24	25	.10	0
				191	.80	117	.48	45
June 18	45	235	Walleye	222	.94	120	.51	65
			N. Pike	93	.40	41	.17	14
				315	1.34	161	.68	79
June 19	32	263	Walleye	236	.90	110	.42	40
			N. Pike	84	.32	30	.11	6
				320	1.22	140	.53	46
June 20	26	218	Walleye	118	.54	66	.30	24
			N. Pike	58	.27	29	.13	12
				176	.81	95	.43	36
June 21	17	142	Walleye	40	.28	18	.13	14
			N. Pike	22	.15	15	.11	13
				62	.43	33	.24	27
Week	249	1,727.5	Walleye	1,051	.61	506	.29	237
			N. Pike	493	.29	213	.12	78
				1,544	.90	719	.41	315

July 16 - 22, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
July 16	-	-	-	-	-	-	-	-
July 17	-	-	-	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-
July 19	6	30	Walleye	30	1.00	22	.73	15
			N. Pike	13	.43	10	.33	5
				43	1.43	32	1.06	20
July 20	6	48	Walleye	25	.52	19	.40	10
			N. Pike	15	.31	12	.25	10
				40	.83	31	.65	20
July 21	6	48	Walleye	38	.79	30	.63	15
			N. Pike	20	.42	16	.33	9
				58	1.21	46	.96	24
July 22	-	-	-	-	-	-	-	-
Week	18	126	Walleye	93	.74	71	.56	40
			N. Pike	48	.38	38	.30	24
				141	1.12	109	.86	64

July 24 - 29, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
July 24	6	48	Walleye	55	1.15	30	.63	10
			N. Pike	25	.52	15	.31	7
				80	1.67	45	.94	17
July 25	6	42	Walleye	48	1.14	34	.81	18
			N. Pike	10	.24	5	.12	2
				58	1.38	39	.93	20
July 26	6	54	Walleye	32	.59	21	.39	12
			N. Pike	16	.30	5	.09	2
				48	.89	26	.48	14
July 27	11	77	Walleye	42	.55	26	.34	18
			N. Pike	24	.31	23	.30	12
				66	.86	49	.64	30
July 28	5	35	Walleye	13	.37	10	.29	10
			N. Pike	5	.14	2	.06	2
				18	.51	12	.35	12
July 29	5	40	Walleye	5	.13	2	.05	2
			N. Pike	10	.25	6	.15	3
				15	.38	8	.20	5
Week	39	296	Walleye	195	.66	123	.42	70
			N. Pike	90	.30	56	.19	28
				285	.96	179	.61	98

August 8 - 15, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Total Retained/ Angler-Hr.	Total Fish Consumed
August 8	3	30	Walleye	8	.27	6	.20	3
			N. Pike	8	.27	5	.17	3
				16	.54	11	.37	6
August 9	3	27	Walleye	5	.19	4	.15	3
			N. Pike	0	.00	0	.00	0
				5	.19	4	.15	3
August 10	3	3	Walleye	0	.00	0	.00	0
			N. Pike	0	.00	0	.00	0
August 11	5	25	Walleye	36	1.44	14	.56	4
			N. Pike	22	.88	5	.20	2
				58	2.32	19	.76	6
August 12	7	50	Walleye	65	1.30	36	.72	12
			N. Pike	32	.64	13	.26	5
				97	1.94	49	.98	17
August 13	10	34	Walleye	17	.50	2	.06	2
			N. Pike	9	.26	2	.06	1
				26	.76	4	.12	3
August 14	10	80	Walleye	65	.81	32	.40	11
			N. Pike	22	.28	11	.14	3
				87	1.09	43	.54	14
August 15	10	64	Walleye	58	.91	27	.42	10
			N. Pike	25	.39	8	.13	0
				83	1.30	35	.55	10
Week	51	313	Walleye	254	.81	121	.39	45
			N. Pike	118	.38	44	.14	14
				372	1.19	165	.53	59

Table 3B. Summary of creel census data for Fishing Lake, 1979.

		June 8-14	June 21-28	August 16-22
Number of Anglers*		71	63	18
Total Angler Hours		563	373.6	124
Number of Walleye	kept	327	149	80
	released	88	70	6
	caught	415	219	86
	consumed	89	68	22
Number of N. Pike	kept	67	58	17
	released	129	30	11
	caught	196	88	28
	consumed	13	12	9
Number of Perch	caught	1		
Number of Lake Trout	kept		10	
	released		0	
	caught		10	
	consumed		5	
Number of Whitefish	caught		1	
	consumed		1	

*Expressed as the cumulative sum of the number of anglers per day.

TABLE 4B

CREEL CENSUS DATA FOR FISHING LAKE, 1979

June 8 - 14, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
June 8	13	70	Walleye	17	.24	15	.21	15
			N. Pike	10	.14	9	.13	9
				27	.38	24	.34	24
June 9	11	71	Walleye	59	.83	54	.76	15
			N. Pike	16	.23	7	.10	1
				75	1.06	61	.86	16
June 10	11	82	Walleye	26	.32	20	.24	11
			N. Pike	25	.30	20	.24	3
				51	.62	40	.48	14
June 11	13	113	Walleye	104	.92	61	.54	16
			N. Pike	34	.30	5	.04	0
				138	1.22	66	.58	16
June 12	9	111	Walleye	125	1.13	112	1.01	24
			N. Pike	50	.45	16	.14	0
				175	1.58	128	1.15	24
June 13	8	72	Walleye	56	.78	44	.61	0
			N. Pike	45	.63	6	.08	0
				101	1.41	50	.69	0
June 14	6	44	Walleye	28	.64	21	.48	8
			N. Pike	16	.36	4	.09	0
				44	1.00	25	.57	8
Week	71	563	Walleye	415	.74	327	.58	89
			N. Pike	196	.35	67	.12	13
				611	1.09	394	.70	102

June 21 - 28, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
June 21	-	-	-	-	-	-	-	-
June 22	-	-	-	-	-	-	-	-
June 23	5	6.6	Walleye	1	.15	0	0	0
			N. Pike	1	.15	0	0	0
				2	.30	0	0	0
June 24	5	29	Walleye	25	.86	21	.72	5
			N. Pike	11	.38	6	.21	2
				36	1.24	27	.93	7
June 25	14	72	Walleye	22	.31	15	.21	7
			N. Pike	10	.14	5	.07	1
				32	.45	20	.28	8
June 26	13	46	Walleye	35	.76	28	.61	0
			N. Pike	25	.54	19	.41	0
				60	1.30	47	1.02	0
June 27	13	113	Walleye	76	.67	37	.33	38
			N. Pike	25	.22	17	.15	4
				101	.89	54	.48	42
June 28	13	107	Walleye	60	.56	48	.45	18
			N. Pike	16	.15	11	.10	5
			Lk.Trout	10	.09	10	.09	5
				86	.80	69	.64	28
Week	63	373.6	Walleye	219	.59	149	.40	68
			N. Pike	88	.24	58	.16	12
			Lk.Trout	10	.03	10	.03	5
				317	.86	217	.59	85

August 16 - 22, 1979

Date	Total Anglers	Total Hours Fished	Species	Total Fish Caught	Fish Caught/ Angler-Hr.	Total Fish Retained	Fish Retained/ Angler-Hr.	Total Fish Consumed
August 16	-	-	-	-	-	-	-	-
August 17	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-
August 19	-	-	-	-	-	-	-	-
August 20	6	24	Walleye	16	.67	16	.67	0
			N. Pike	3	.13	3	.13	0
				19	.80	19	.80	0
August 21	6	46	Walleye	26	.57	24	.52	10
			N. Pike	18	.39	9	.20	9
				44	.96	33	.72	19
August 22	6	54	Walleye	44	.81	40	.74	12
			N. Pike	7	.13	5	.09	0
				51	.94	45	.83	12
Week	18	124	Walleye	86	.69	80	.65	22
			N. Pike	28	.23	17	.14	9
				114	.92	97	.79	31

APPENDIX C

AVERAGE ANGLER EXPENDITURES INCURRED AT SASA-GINNI-GAK LODGE DURING THE 1979 ANGLING SEASON

The major method of transportation to Riverton is by automobile. To estimate costs of transportation, concentric circles of a 250 mile radius were extended from Riverton, and the percentage of anglers within each radius were approximated from known areas of residence (Table 10). The cost of operating an average automobile in 1979 was $0.30 per mile (National Transportation Statistics 1977 and U.S. Department of Commerce, Survey of Current Business 1979). An average day's travel was assumed to be 250 miles, at an approximate cost of $50 per angler per day. Expenditures were calculated for a return trip with an average of two anglers per vehicle.

Transportation by air from Riverton to the lodge was $75 per person return. Accommodation costs were $35 per person per day. Food, beverage and incidental costs were estimated at $25 per person per day.

On the basis of the above information, total expenditures were estimated as:

Transportation and travelling costs to Riverton	≈ $200,000
Transportation from Riverton to the lodge	≈ $ 44,000
Accommodation	≈ $ 96,000
Food, beverage and incidental expenses	≈ $ 69,000
Total expenditures	≈ $409,000
Average expenditure per angler	≈ $ 700

All expenditures incurred by anglers were in Manitoba, with the exception of travel costs to Riverton. Transportation and travelling costs within Manitoba are approximately $56,000.

Total expenditures in Manitoba	≈ $265,000
Average expenditure per angler in Manitoba	≈ $ 450

AVERAGE ANGLER EXPENDITURES INCURRED AT FISHING LAKE LODGE DURING THE 1979 ANGLING SEASON

The majority of anglers travelled by air to Winnipeg. The average return air fare was $300, and average overnight expenditures in Winnipeg were $100. Most guests stayed for one week. Food, accommodation and guide services were offered as an all-inclusive package at $1,000 per week. Beverage and incidental expenditures were estimated at $100 per angler per week.

Total expenditures were thus estimated as:

Transportation to Winnipeg	≃	$ 75,300
Overnight expenses in Winnipeg	≃	$ 25,100
Transportation to Fishing Lake) Food and accommodation)	≃	$251,000
Beverages and incidental expenses	≃	$ 25,100
Total expenditures	≃	$376,500
Average expenditure per angler	≃	$ 1,500
Total expenditures in Manitoba	≃	$301,200
Average expenditure per angler in Manitoba	≃	$ 1,200